Orbital Fractures/Orbital Blowout Fractures

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Topics for Discussion

- Orbital anatomy
- Types of fractures
- Signs and symptoms
- Management

Orbital Anatomy

- The bony orbit refers to the shell of bone which surrounds and protects the eye.
- The bony orbit is a pyramidal cavity with an elliptical base presenting anteriorly and the apex posteriorly at 22 degrees lateral from the visual axis.

Bony Orbit

- Seven bones form the bony orbit
  - Maxilla
  - Zygoma
  - Lacrimal
  - Ethmoid
  - Palantine
  - Sphenoid
  - Frontal

Superior Orbital Wall

- Formed by:
  - Frontal bone
  - Lesser wing of sphenoid
- Functions as:
  - Floor anterior fossa
- Important structures:
  - Supraorbital notch which transmits the supraorbital nerve

Medial Orbital Wall

- Formed by (from anterior to posterior):
  - Maxilla
  - Lacrimal bone
  - Ethmoid
  - Sphenoid
- Important structures:
  - Lamina papyracea
  - Nasolacrimal canal

Lamina Papyracea

- Thin segment of the medial orbital wall
- Separates the orbit from the ethmoid air cells

Nasolacrimal canal

- Contains nasolacrimal duct
- Passes from lacrimal sac to inferior meatus

Lateral Orbital Wall

- Formed by:
  - Zygomatic bone
  - Greater wing of sphenoid

Orbital Floor

- Formed by:
  - Maxilla
  - Palatine
- Important structures:
  - Infraorbital groove
    - Transverses floor from lateral to medial
    - Location of infraorbital nerve which supplies sensation to check and ipsilateral upper alveolus and teeth

Orbital Floor

- Forms roof of maxillary sinus
- Location of more blow out fractures due to inherent weakness of bone overlying maxillary sinus

Three important apertures at the apex of bony orbit

- Optic canal
- Superior orbital fissure
- Inferior orbital fissure

Optic Canal

- Contains:
  - Optic nerve
  - Ophthalmic artery

Superior Orbital Fissure

- Separates lateral wall from roof
- Transmits the following structures:
  - Oculomotor nerve (CN II)
  - Trochlear nerve (CN IV)
  - Abducens nerve (CN VI)
  - Ophthalmic division of trigeminal nerve
  - Ophthalmic vein

Inferior orbital Fissure

- Connects to pterygopalantine fossa
- Located between floor and lateral wall
- Transmits:
  - Infraorbital branch V2
  - Orbitalis muscle

Blowout Fractures of Orbit

- Originally defined as orbital floor fractures without fracture orbital rim, but with entrapment one or more soft tissue structures

Blowout Fractures

- Blowout fractures now refer to fractures of the:
  - Orbital floor
  - Medical wall
  - Lateral wall
  - Superior wall
- “pure” blowout fractures – trapdoor rotation to bone fragments involving central area of bone
- “impure” fracture – fracture line extends to orbital rim

Physiology of Blowout Fracture

- The bony defect is filled with soft tissue and fat from the orbit
- Alters support mechanisms for EOM
- EOM can become entrapped
- Direct muscle damage can result

Common causes of orbital fractures

- Falling
- Aggression
- Sporting events
- MVAs

Initial Evaluation

- History
  - Time and mechanism of injury
  - Change in appearance of eye
  - State of vision immediately after injury
    - Immediate loss of vision – severe damage to retina
    - Loss of light perception - vascular occlusion or optic nerve compression
    - Initial good vision – compression optic neuropathy

Initial Evaluation

- Physical Exam
  - Cranial nerve examination
    - EOM
    - Numbness check
  - Palpation orbital rim
  - Papillary function
  - Visual acuity
  - Fundus examine
  - Ophthalmologic evaluation

Visual Acuity

- Light perception
- Finger counting
- Visual acuity

Consultation

- Do not hesitate to obtain an ophthalmologic consultation

Common physical signs

- Periorbital eccyhmosis
- Impaired extraocular muscles
- Hypoesthesia in V2 distribution
- Intraorbital emphysema

Common Symptoms

- Diplopia
- Pain with eye movement

Radiographic Evaluation

- CT scan of the orbits
- Plain films not useful due to a high rate of false negatives and non-diagnostic studies

Injuries associated with blow out fractures

- Ruptured globe
- Retroorbital hemorrhage
- Vitreous hemorrhage
- Hyphema
- Anterior chamber angle recession
- Dislocated lens
- Secondary glaucoma
- Retinal detachment

Treatment Options

- Nonsurgical
- Surgical

Initial Management

- Ice affected area for 48 hours
- Elevation HOB
- Use of nasal decongestants
- Broad spectrum antibiotics like Augmentin
- Oral steroids to prevent fibrosis
- No ASA
- No nose blowing

Absolute Indications for Surgical Repair

- Diplopia
- Enophthalmos >2 mm

Relative Indications for Surgery

- CONTOVERSIAL AREA
- Substantial soft tissue herniation into maxillary sinus
- Intraoribital emphysema
- Hypoestheia in V2 distribution

Contraindications to surgery

- Hyphema
- Retinal detachment
- Globe perforation
- Only seeing eye
- Medically unstable patient

Timing of Surgery

- Usually seven to ten days after trauma

Surgical Approaches

- Transconjunctival approach
- Transcutaneous
- Subciliary
- Trasantral

Factors to consider for surgery

- Site
- Location
- Severity
- What needs to be corrected

Surgical procedures for orbital floor fractures

- Incision
- Subtarsal dissection
- Skin-muscle flap
- Incision of maxilla
- Floor dissection
- Placement of Marlex mesh
- Periosteal closure
- Skin closure

Orbital Implants

- Use of implants based on degree of comminution and size of fracture
- Various implant material used
  - Autogenous bone and cartilage
  - Alloplastic material
    - Teflon
    - Marlex
    - PDS
    - Etc.

Complications of Surgery

- Ectropion
- Lid retraction
- Persistent diplopia
- Malposition of eye
- hypoesthesia
- Extrusion of orbital floor implant

Rare complications

- Ipsilateral fourth cranial nerve palsy
- Post-op mydriasis
- Blindness (1/1,500)

Conclusions

- Assessment of orbital fractures is an area that requires a high index of suspicion